Course Title: Mathematics for Bioinformatics
Course Code: BI-802
Course Objectives:
After completing this course:
- Students will be able to apply the core concepts of biology and mathematics to understand mechanistic models of biological systems (PEO 3).
- Students will be able to developed computational applications/tools related to bioinformatics (PEO 5).

Course Outcomes:
- Students will be able to apply the core concepts of biology and mathematics to understand mechanistic models of biological systems
- Students will be able to developed computational applications/tools related to bioinformatics

Course Contents
- Linear Models of Structures Population
  - Matrix Algebra
  - Projection Matrices
  - Eigen Vector and Eigen Values
- Dynamic Modeling with Difference Equations
  - The Malthusian Model
  - Variations on Logistic Model
  - Discrete and Continuous Models
- Nonlinear Models of Interactions
  - A Simple Predator-Prey Model
  - Equilibria of Multi-population Models
  - Positive and Negative Interactions
  - Linearization and Stability
- Modeling Molecular Evolution
  - Background on DNA
  - Matrix Models of Base Substitution
  - Phylogenetic Distances
- Infectious Disease Modeling
  - Elementary Epidemic Models
  - Threshold Values and Critical Parameters
  - Multiple Populations and Differentiated Infectivity
- Curve Fitting and Biological Modeling

Recommended / Reference Books:

- Elizabeth S. Allman, John A. Rhodes. Mathematical Models in Biology: An Introduction, Cambridge University Press, 2003
- Matthew He, Sergey Petoukhov, Mathematics of Bioinformatics Theory, Practice, and Applications, John Wiley & Sons, 2011
- Strang, Gilbert. Introduction to Linear Algebra. 4th ed. Wellesley, MA: Wellesley-Cambridge Press, February 2009.